

REMARKS/ARGUMENTS

In the pending Office Action, the Examiner made final the restriction requirement. Accordingly, the Examiner deemed Claims 1-5, 8, 9, 11-14 and 25-34 to read on the elected species, while Claim 6, 7, 10, 15-24 and 35-46 are deemed to be withdrawn from further consideration as being directed to non-elected species. By this Amendment and Response, Applicants have amended Claims 1 and 25, canceled Claims 2 and 26, and added new Claims 47-63. Therefore, the pending claims now are Claims 1, 3-5, 8, 9, 11-14, 25, 27-34, and 47-63.

The Examiner rejected Claims 1-5, 8, 9, 11-14, and 25-34 under 35 USC § 103(a) as being unpatentable over Shaniuk et al. (U.S. Patent No. 6,030,537) in view of published Japanese Patent Application No. 1-127094. The Examiner stated that Shaniuk et al. discloses a process for removing arsenic from water by contacting the water with an adsorbent material in a packed column and that Shaniuk et al. discloses the claimed invention with the exception of the specific reactant material employed. After stating that published Japanese Patent Application No. 1-127094 discloses adsorbing arsenic from a waste liquid with porous limestone, the Examiner concluded it would have been obvious to one of ordinary skill in the art to substitute the limestone of the Japanese application for the adsorbent material of Shaniuk et al.

However, the cited references disclose inventions different from that of Applicants. Shaniuk et al. discloses a method for removing arsenic from aqueous systems with an adsorbent material comprising (i) activated bauxite and (ii) aluminum trihydrate. This composite adsorption material must be prepared by a multi-step process that includes (i) mixing powders of activated bauxite and aluminum trihydrate in the presence of water to form granules; (ii) drying the granules, and (iii) calcining the dried granules. See Shaniuk et al., Abstract, Claim 1. In the example provided, Shaniuk et al. specifically discloses that:

The invention demonstrates significantly improved arsenic removal capacity over either activated bauxite or aluminum trihydrate alone. These results show an

unexpected, synergistic effect whereby the combination of activated bauxite and aluminum trihydrate remove arsenic at higher adsorbent capacity . . . The results were unexpected in that the invention removed arsenic significantly better than the predicted performance calculated based on the individual performance of the components used in Example 1. See Shaniuk et al., Col.5, ll.19-31.

In summary, Shaniuk et al. discloses a specific combination of two chemicals, activated bauxite and aluminum trihydrate, that are prepared in a specific way and that work together to provide an unexpected, synergistic effect. Other than this specific combination of reactants, Shaniuk et al. does not disclose or suggest that any other adsorbent material would work, let alone limestone and/or dolomite. Indeed, Shaniuk et al. represents a type of arsenic removal, as disclosed in Applicants' specification, that requires "significant technical intervention and processing making it impractical for all but larger water systems." Applicants' Specification, p.4, ll.12-15.

The abstract of the Japanese application generally discloses the use of porous limestone to remove arsenic from a waste liquid, i.e., the use of coral limestone ("porous limestone") to remove arsenic from industrial solutions ("waste liquids"). More specifically, the Japanese application abstract discloses that the adsorbing capacity of the porous limestone may be increased by treating the porous limestone with a chemical agent such as ferric chloride, aluminum sulfate, magnesium nitrate, ferric hydroxide, or glutaraldehyde. As with Shaniuk et al., this is a relatively more complex process in which specific chemicals are added to remove arsenic, in this case from industrial waste.

There is no disclosure in the English language abstract of the Japanese application regarding the effectiveness of the adsorption of arsenic by the limestone, with or without the added chemical agents. That is, the abstract does not disclose the removal of arsenic down to levels suitable for human consumption, such as 30 parts per billion, 20 parts per billion, 10 parts per billion or even 5 parts per billion. Since the Japanese application is directed to waste liquids, not drinking water, and is directed to enhancing the adsorption of arsenic by adding additional chemicals to porous

limestone, it is not surprising that the abstract does not disclose or suggest a method of using limestone alone to reduce arsenic levels to 30 parts per billion or less.

Applicants disclose a different invention. Applicants have invented a method using limestone and/or dolomite to effectively reduce the amount of arsenic, including arsenic compounds and arsenic species, in water to levels suitable for human consumption, such as 30 parts per billion and lower. Applicants' method does not require the relatively complex preparation of composite absorbent materials such as those disclosed by Shaniuk et al., nor does Applicants' method require the addition of chemical agents such as ferric chloride, aluminum sulfate, magnesium nitrate, ferric hydroxide or glutaraldehyde to coral limestone, as disclosed by the Japanese patent application. Due to its simplicity, low cost and widespread availability of reactant, and demonstrated effectiveness down to very low levels of arsenic across a wide pH range, Applicants' method may be used in a wide variety of water systems, including smaller volume systems for drinking water such as home, rural or other relatively smaller facilities.

In various embodiments of the invention, Applicants disclose using limestone and/or dolomite in the form of particles of certain dimensions to achieve the desired reduction in arsenic levels, e.g., particles having a diameter of approximately 0.001 mm to approximately 10 mm (Claims 47, 53, 60), particles having a diameter of approximately 0.001 mm to approximately 1 mm (Claims 48, 54), particles having a diameter of approximately 0.001 mm to approximately 0.1 mm (Claims 49, 55), particles with a grain size of approximately 5 mm to approximately 7 mm (Claims 51, 57) and pellets having a nominal diameter/length of approximately 0.1 mm to approximately 10 mm (Claims 50, 56). Experimental results demonstrated a marked reduction in arsenic concentrations (to 5 ppb or less) with relatively small amounts of limestone in the particle sizes disclosed. See Specification, p.13, l.8 - p.14, l.7; Figs. 4-5. Again, the cited art does not disclose or suggest the use of these forms of limestone and/or dolomite, let alone the use of such forms of limestone and/or dolomite to achieve the claimed results.

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Applicants' method achieves the reductions in arsenic levels in a significantly simplified manner over the cited art. This allows the method to be advantageously employed in a greater number and variety of systems, such as arsenic reduction using a removable cartridge containing the reactant (Claims 8, 30) and arsenic reduction at the point of source (Claims 13, 33), at the point of use (Claims 12, 32) and at points between the source and use (Claims 12, 33). The cited out does not disclose or suggest any such methods.

Additionally, Applicants have demonstrated a method to reduce the amount of arsenic in aqueous solutions over a wider variance of pH, including the common, naturally occurring pH of water. See Specification, p. 13, l. 17 - p. 14, l. 7; Fig. 5; see also Claim 52, 58. This also allows Applicants' method to be advantageously employed in a variety of systems and locations. Again, the cited art does not disclose or suggest such methods.

Based upon the foregoing, Applicants respectfully submit that the cited art does not disclose or suggest the claimed invention, and that the pending claims are allowable over the cited art. If the Examiner believes that a telephone interview would expedite prosecution of this application, the undersigned attorney is available at the telephone number below.

Respectfully submitted,

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Date: August 11, 2003